UNDER THE MEDITERRANEAN I

Studies in Maritime Archaeology

edited by
STELLA DEMESTICHA & LUCY BLUE

WITH KALLIOPI BAIKA, CARLO BELTRAME,
DAVID BLACKMAN, DEBORAH CVIKEL, HELEN FARR
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HONOR FROST FOUNDATION

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Published by Sidestone Press, Leiden
www.sidestone.com

Imprint: Sidestone Press Academics

Lay-out & cover design: Sidestone Press

Photograph cover:
- Main image: Mazotos shipwreck, Cyprus (photo: Al. Erdozain © MARELab)
- Inset: Mandirac 1 near Narbonne France (photo: C. Durand, CNRS, UMR 7299–CCJ)
- Inset: *Ma'agan Mikhael II* before being launched in Haifa, Israel (photo: A. Efremov)

ISBN 978-90-8890-945-0 (softcover)
ISBN 978-90-8890-946-7 (hardcover)
ISBN 978-90-8890-947-4 (PDF e-book)

Series editor: Miranda Richardson
Copy editor: Alva MacSherry
Text preparation: Bob Holtzman

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The Hellenistic-Early Roman Harbour of Akko

Preliminary finds from archaeological excavations at the foot of the southeastern seawall at Akko, 2008-2014

Jacob Sharvit, Bridget Buxton**, John R. Hale***, and Alexandra Ratzlaff*****

Between 2009 and 2012, a large excavation, preservation, and restoration project was carried out along 220 m of the southeastern seawall of Akko, Israel. In 2013-2014, a combined Israeli-American excavation team, supported by HFF, searched for the continuation of the terrestrial features under water. The excavations exposed for the first time Hellenistic features below the present sea-level: a stone-built quay, large mooring stones, a shipshed, and other structures that provide a layout for the ancient Hellenistic port. In addition, a thick layer of port sludge rich in pottery vessels continued down to bedrock.

Keywords: Ancient harbours, shipshed, preservation, coastal changes, underwater archaeology.

At the beginning of the 3rd century BCE, the Ptolemaic Egyptian and Seleucid Syrian dynasties were the dominant powers of the eastern Mediterranean. The coastal regions of Coele-Syria and Phoenicia lay between the rival empires and were aggressively claimed by both. From the 270s BCE until the mid 2nd century BCE, seven Syrian Wars were fought for possession of this fertile territory and its strategic coastal fortresses (Kasher, 1988: 22-23; Beeri, 2008). Seapower was vital to the Ptolemaic strategy for holding Coele-Syria (Ben-Yosef, 2008: 293), and the military port and colony of Ptolemais-Ake (modern Akko, Acre) was established by Ptolemy II as a critical part of Egypt's maritime defences.

Akko occupied a strategic position almost exactly halfway between Raphia on the borders of Egypt and the Eleutheros river on the borders of Seleucid Syria. With Ptolemaic investment, the natural anchorage soon developed into the pre-eminent port of the central Levant. We learn about the importance of the harbour from the 2nd-century BCE letter of Aristeas (Aristeas, 47): 'The country has good ports providing for its needs at Ashkelon, Jaffa, Gaza, and also Ptolemais which was founded by the king…' (Rappaport, 1970: 2-3). Aristeas describes Akko as one of the four major port cities in the land of Israel, and as its most important northern port. The 1st-century geographer Strabo referred to Akko as a large city – a 'megalopolis' (Strabo, *Geography* 25.2.16) and noted that the Persians used it as their base of operations against Egypt. Akko housed the Ptolemaic mint (Tal, 2006: 304-306), and later served as the centre of

** Israel Antiquities Authority, koby@israntique.org.il*

*** University of Rhode Island, babuxton@uri.edu*

**** University of Louisville, jrhale@louisville.edu*

***** Boston University, ratzlaff@bu.edu*

in: Demesticha, S. and Blue, L. *et al.* (eds) 2020, *Under the Mediterranean I. Studies in Maritime Archaeology*, Leiden: Sidestone Press, pp. 163-180.

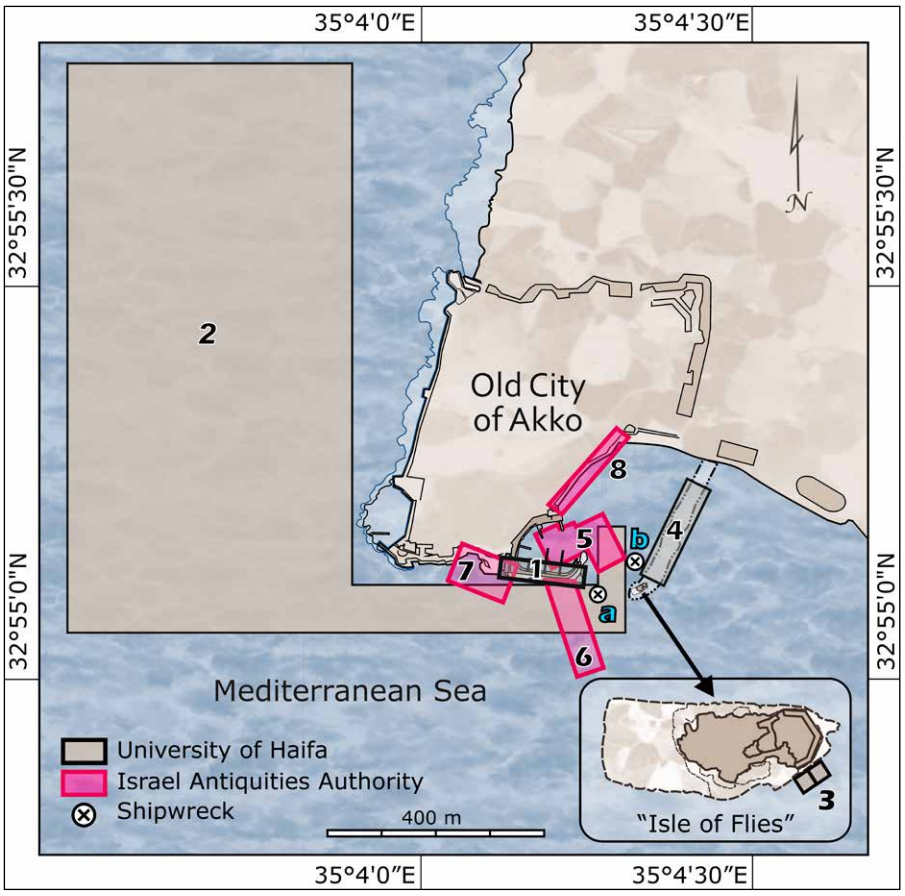


Figure 1. Location map of the surveys and excavations carried out in Akko harbour and surroundings beginning in 1964 until 2012: 1) Linder and Raban, 1964-1966: excavation of southern breakwater and seawall; 2) Linder, Flinder and Hall, 1966: Magnetometer survey; 3) Linder and Raban, 1976-1978: Test trench in the foundations of the Isle of Flies; 4) Kahanov and Yurman, 2006-2008: Test trench in the eastern rampart; 5) Galili and Sharvit, 1992-1993: Deepening of Akko port; 6) Galili and Sharvit, 1995: Survey for the extension of the southern breakwater; 7): Galili and Sharvit, 1993: Underwater survey in the Pizani anchorage; 8): Sharvit and Planer, 2008-2012: Excavation along the foot of the seawall; a) Raban, 1986: Excavation of 18th-century shipwreck Sydney Smith; b) Cvikel and Kahanov, 2006-2008: Excavation of 'Akko 1' shipwreck (Drawing: S. Ben-Yehuda).

operations for Ptolemy VI when he recaptured Coele-Syria during the Seventh Syrian War (147-145 BCE).

Both the Ptolemies and (after Antiochus III) the Seleucids maintained powerful navies, and herein lay Akko's value as one of the few defensible ports along Israel's dangerously exposed coast. But while the triremes that formed the backbone of earlier Classical period navies required nothing more than a smooth beach to draw up on, Hellenistic fleets were dominated by larger vessels. Maintaining even a small number of decked warships at Akko year-round would have required sheltered docks and slipways, workshops, and other facilities; a fully provisioned fleet would have needed a true deep-water port. The central place of Ptolemais-Akko in the war narratives of the late 3rd and early 2nd centuries BCE demands that special attention be paid to the nature of Ptolemaic arrangements for the port (Grainger, 2010). On at least one occasion Akko was captured by the Seleucids with a Ptolemaic squadron still in port, either at anchor or hauled up on slipways. This was during the Fourth Syrian war, when a number of northern towns quickly went over to the Seleucids (Polybius, 5.62.6), including the strategic cities of Scythopolis and Philoteris (Polybius, 5.70.4-5), and the crucial ports of Ptolemais (Akko) and Tyre. These coastal fortresses were seized by the local Egyptian governor Theodotos when he resolved to join the Seleucid cause (Polybius, 5.61.5-6). Here – probably at Akko – he obtained a large squadron of well-equipped warships: 20 cataphract (decked) warships and a variety of smaller vessels (Polybius, 5.62.2-3). Until recently, no facilities to support such a naval force had ever been found at Akko, and the location and dimensions of its ancient harbours were unknown; there was no evidence of a deep-water port. Yet it was difficult to see how Akko's

shallow eastern basin could have accommodated even the comparatively small squadron seized by Theodotus, let alone the full might of the 3rd-century Ptolemaic fleet on campaign, which numbered more than 300 warships (Morrison, 1996: 37-38; Grainger, 2010: 84-85).

From 1965 onwards, Elisha Linder and Avner Raban led the first underwater excavations and surveys at Akko (Linder and Raban, 1966; Raban, 1978: 238-240; Flinder *et al*, 1993: 199-226). These excavations revealed sections of a southern breakwater and foundations of a possible 3rd-century BCE lighthouse structure built according to the Phoenician header technique on a rocky islet at the western end of the southern breakwater, known today as the Tower of Flies (Fig. 1). After the Linder and Raban excavations, no further underwater archaeological excavation of the ancient port occurred for the next 28 years, excluding underwater surveys, shipwreck excavations, and harbour-maintenance dredging (Fig. 1). The renewal of underwater excavations relating to the port facilities began in 2006 with the investigation of the submerged eastern breakwater that joins the beach and the Tower of Flies (Fig. 1.4), a fortification attributed to Ibn Tulun in the 9th century CE (Kahanov *et al*., 2007: 16-18; 2008: 19-22).

In 2007 a conservation engineering survey of Akko's southern seawall revealed large gaps and cracks as well as extensive marine abrasion of the wall's stones. Due to the severity of the damage, the Israel Antiquities Authority (IAA) and Old Acre Development Company initiated a comprehensive conservation project of the entire southern seawall down to its foundations. This project began in 2008 and ended in 2013. During this time, the IAA excavated a trench along the base of the seawall, 5 m x 270 m. These were the most extensive excavations to date in the area of the ancient port, and the work also revealed new information about the construction of the Ottoman seawall.

In 2010-2014 the excavations were extended, and underwater trenches were dug in collaboration with a team from the University of Rhode Island and the University of Louisville, Kentucky. The findings corroborate for the first time the existence of a military port dating to the Hellenistic Period in Akko and point to its location in the eastern basin. In this article, we will discuss the main findings and present the preliminary conclusions from the excavations.

Excavation and findings

The historic and archaeological importance of Akko was first acknowledged during the British Mandate. Under the auspices of the British Mandate Department of Antiquities between 1920 and 1948, a structural survey of the city fortifications was undertaken that included operations to reinforce the southern seawall (Makhouly and Johns, 1946). The reinforcements consisted of placing layers of cement-filled sacks along the base of the wall with a cement beam cast over them (Winter, 1944: 9-10). Following these early operations, the Old Acre Development Company and the Conservation Department of the IAA continued to perform occasional structural surveys and limited conservation works along the southern section of the wall during the 1990s. In 2006, a survey

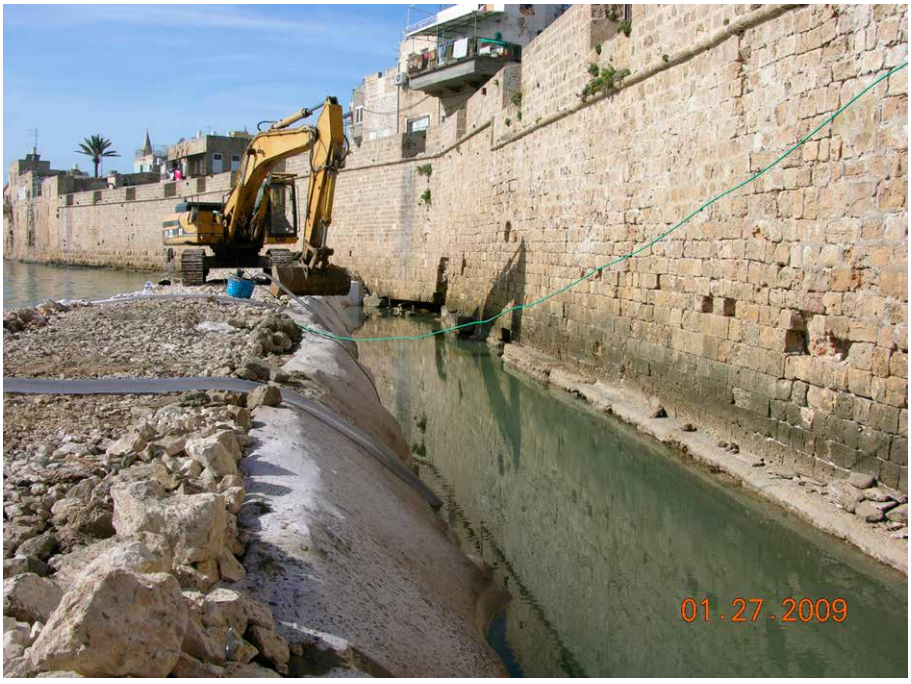


Figure 2. Building the dam along the foot of the seawall. The area between the wall and temporary rampart/service road was divided into six separate pools, from which the water was pumped out in succession as the archaeological and conservation works progressed (Photo: D. Planer).

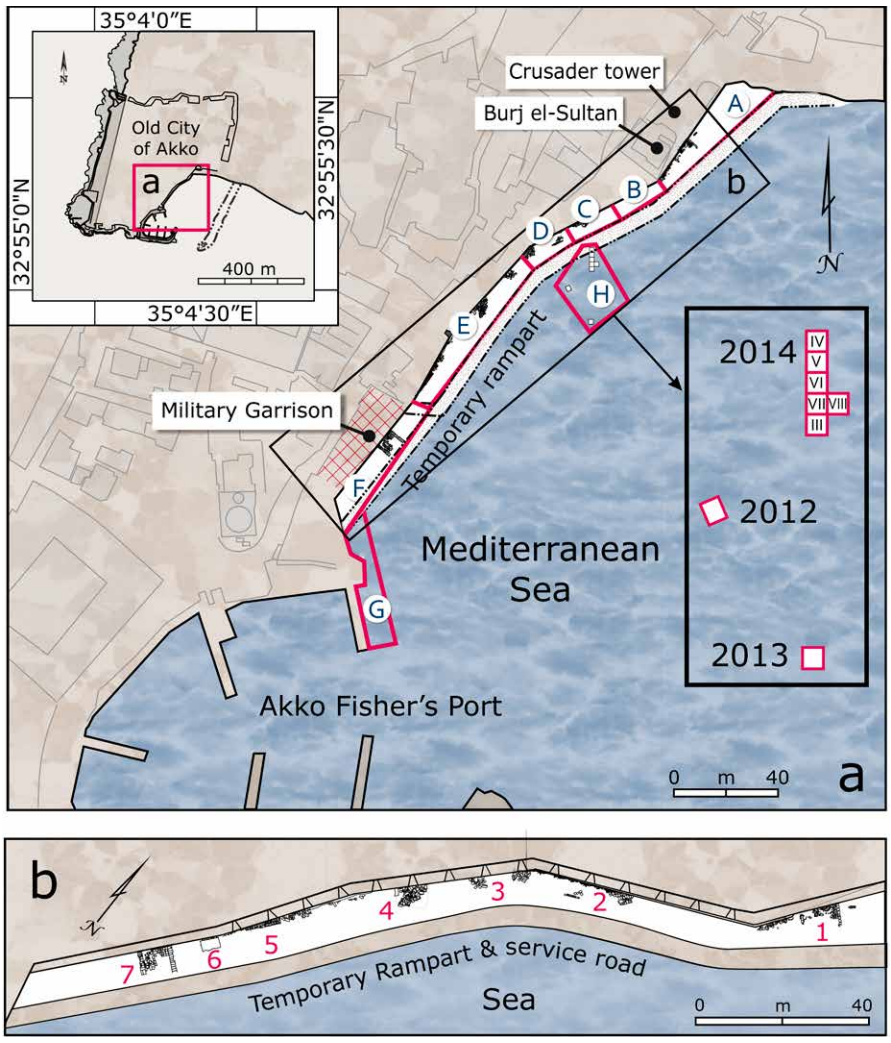


Figure 3. Plan of excavation areas (A-G) and location of the structures and installations discovered (lower strip): (1) remnants of an Ottoman structure approaching the wall; (2) Hellenistic dock; (3-4) collapsed buildings; (5) rectangular Hellenistic building; (6) Ottoman wooden pole foundations; (7) Hellenistic shipshed (Drawing: S. Ben-Yehuda).

revealed large sections in danger of collapse. Archaeological investigations along the foot of the wall, between the shore and the Crusader tower, Burj el-Sultan, were carried out to gather structural and archaeological information for planning purposes (Sharvit and Planer, 2008). The trenches revealed that the foundations of the wall were built on unconsolidated natural sediments and ancient debris of collapsed buildings and that the bedrock lay at depths 2-2.6 m below the modern sea-level. In view of this, the reinforcement of the wall was undertaken from the bedrock up to the wall foundation. As this kind of operation could not be executed underwater, a temporary rampart was laid out parallel to the wall to function as a service road and dam (Fig. 2). The channel formed between the wall and rampart was divided into six separate pools (Areas A-F; Fig. 3), and seawater was pumped out of each pool in turn. Conservation and archaeological excavations commenced simultaneously. Due to the risk of the collapse of the foundations, excavation squares were dug alternately until the completion of the reinforcement along the base of the seawall (Schaffer *et al.*, 2014).

In the area between the shoreline and the Crusader tower Burj el-Sultan, ancient wall foundations made of large, finely cut stones built directly upon the bedrock (beach rock) were revealed (Area A; Fig. 3.1). The base layer of the Ottoman seawall was built on top of the remains of the ancient wall, using it as a foundation. The excavation yielded decorated capitals, fragments of columns, and Byzantine pottery. It is possible that this section of ancient wall belongs to the remnants of the renowned convent of the Order of Saint Clare or Franciscan sisters (Fig. 4). When Akko fell in 1291, tradition records that the sisters disfigured themselves to escape dishonour at the hands of the Mamluks (Dichter, 1973: 178; Schiler, 1983).

Excavation in the southwestern corner of the Crusader tower, Burj el-Sultan (Area B, Fig. 3), revealed that its foundations were also built on bedrock at a depth of 2.3 m below the modern sea-level, and were construct-

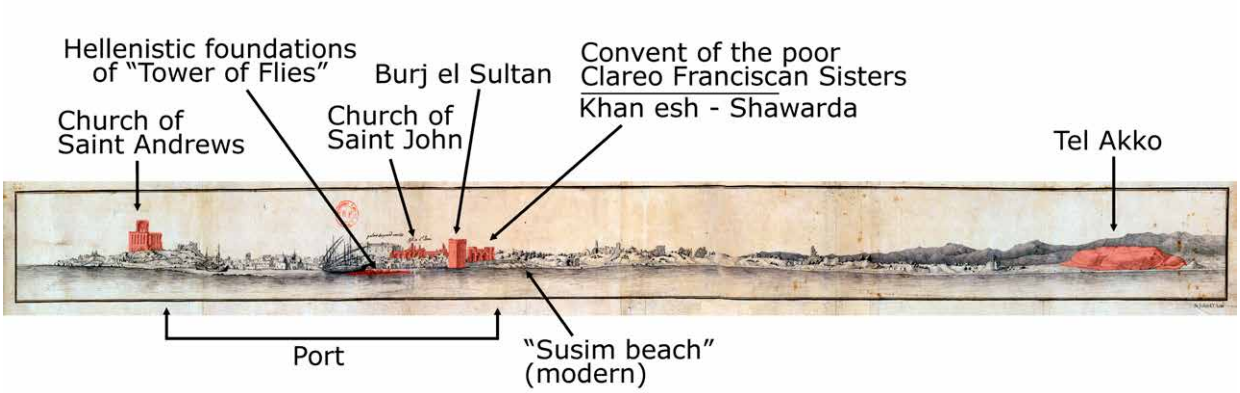
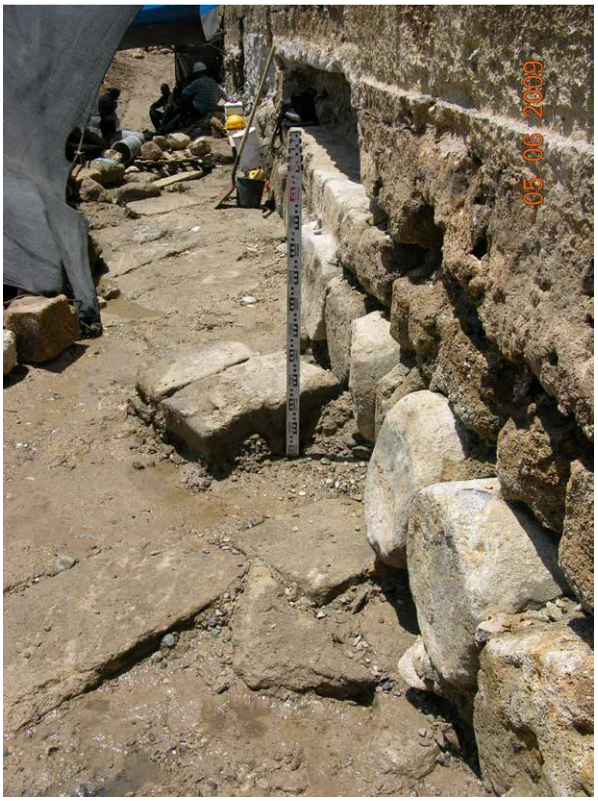


Figure 4. Painting of Acre, c.1686 (Phot. Bibl. Nat. Paris. Rés. Ge. DD. 226 [14]) (Kedar, 1997: fig. 7). View of the city and the harbour from a south-east point in the sea, showing the main structures (marked in red) of the city before the construction of the Ottoman seawall.

Figure 5. The southwestern corner foundation of the Burj el-Sultan tower built on the bedrock at a depth of -2.2 m. The foundation was exposed during underwater excavation in the 2009 season.

Figure 6. East-West view of the Ottoman seawall foundation made of a row of columns in secondary use placed on top of the Hellenistic docking platform floor (Photo: J. Sharvit).

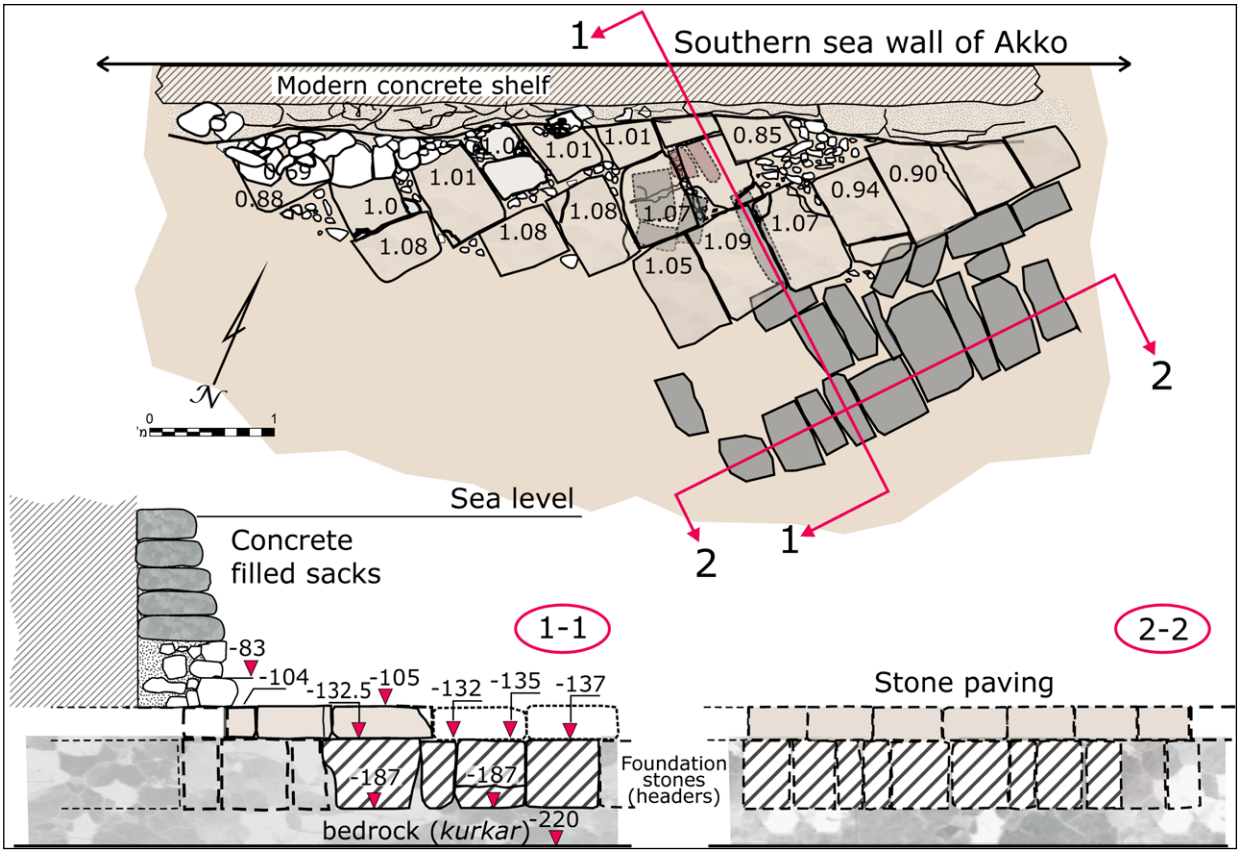


ed of shaped blocks of *kurkar*, a local coastal sandstone (Fig. 5). Approaching the Burj tower from the southwest was an Ottoman rampart built directly upon the bedrock lying at 2.4 m below the modern sea-level. The battery was constructed of a mixture of fieldstones bonded together with a type of cement made of lime and animal bones. Two layers of granite, marble, and Roman *kurkar* columns in secondary use were placed horizontally over the battery, and the first stone layer of the seawall was constructed on top (Fig. 6). The columns, marble capitals, and large ashlar stones were shipped from the ruins of Caesarea Maritima and from the crusader castle of Château Pèlerin at Atlit to build the Ottoman walls of Akko (Winter, 1944; Makhouly and Johns, 1946: 56).

Near the southern edge of the Ottoman battery, an impressive floor built of stone slabs, each measuring 0.8 x 0.4 x 0.15 m, was exposed (Area C: Fig. 3.2). The length

Figure 7. North-south view of the Hellenistic docking platform (Area C) after removal of the British Mandate reinforcement of cement beam and sacks. The exposed wall foundations are comprised of marble, granite, and kurkar columns placed directly on the Hellenistic quay (Photo: J. Sharvit).

Figure 8. Plan of the Hellenistic quay and an east-west section of the seawall and the platform.



of the exposed area is some 30 m, and it continues both northwest underneath the wall and southeast under the temporary rampart or dam (Figs 7, 8). The stone slabs were placed on a layer of cut *kurkar* blocks arranged in the header technique, which is a typical feature of Phoenician and Hellenistic Greek construction in the region (Stern, 1992: 104-105; Tal, 2006: 33-34). A test pit was dug under the floor, revealing a sealed layer of sludge characteristic of the bottom of a harbour. This layer contained numerous Hellenistic finds from the 4th-1st centuries BCE, indicating that the quay was built or refurbished during the Late Hellenistic when Ptolemais-Akko was still the major port of the central Levantine coast. The southwestern parts of the quay under the wall were disturbed, and missing parts of it could be seen under the temporary rampart (Fig. 3.2).

During the construction of the Ottoman fortifications, a line of columns was placed over part of the quay floor pavement to serve as the foundation for the seawall (Figs 6, 7). This shows that the Ottomans were aware of the submerged ancient floor and used it as a foundation. The existence of the quay structure was also known during the British Mandate period, as they even published a version of the 14th century CE map of Marino Sanudo depicting this feature (Makhouly and Johns, 1946: fig. 10) – though it appears no one made the connection between this structure and the 'lost' Hellenistic port of Ptolemais.

A few metres southwest of the quay in Area D (Fig. 3.3), excavation revealed a 30 m-long scatter of dressed stone blocks (0.6 x 0.6 x 1.2 m; see Fig. 9). This included some large intact ashlars (Fig. 10; blocks numbered 22-23). Under these ashlars, the sealed layer of harbour sludge contained Hellenistic finds. Under these stones, there was a sealed layer of harbour sludge lying upon the bedrock which contained Hellenistic finds. It appears that the collapsed blocks belonged to a large building that was originally part of the quay.

A rectangular Hellenistic structure was discovered (oriented east-west) in Area E (Fig. 3.5). The entire eastern section of this building was fully exposed, as were sections of the northern and southern walls of the structure that continued underneath the seawall. The structure is built directly on the bedrock and consists of five layers of smooth kurkar ashlars; it is 8 m long and approximately 1.6 m high (Fig. 11). A row of wooden posts rises from this rectangular structure and continues beyond it; the entire row of posts extends approximately 100 m along the base of the seawall.

Each post is 3 m high with a diameter of 200-300 mm. Most posts are spaced 300 mm apart, though some stand immediately adjacent to each other (Fig. 12). The bottom tip of each post is sharpened to a point and fitted with a metal spike approximately 400 mm long. The spikes have a 200 mm-long cast tip and three barbs (Sharvit *et al.,* 2013: 45, fig. 8). The metal spikes facilitated the insertion of the posts into the ground, and the wings

Figure 9. East-west view of massive rockslide of ashlar stones belonging to Hellenistic building situated near or part of the harbour installations (Photo: J. Sharvit).

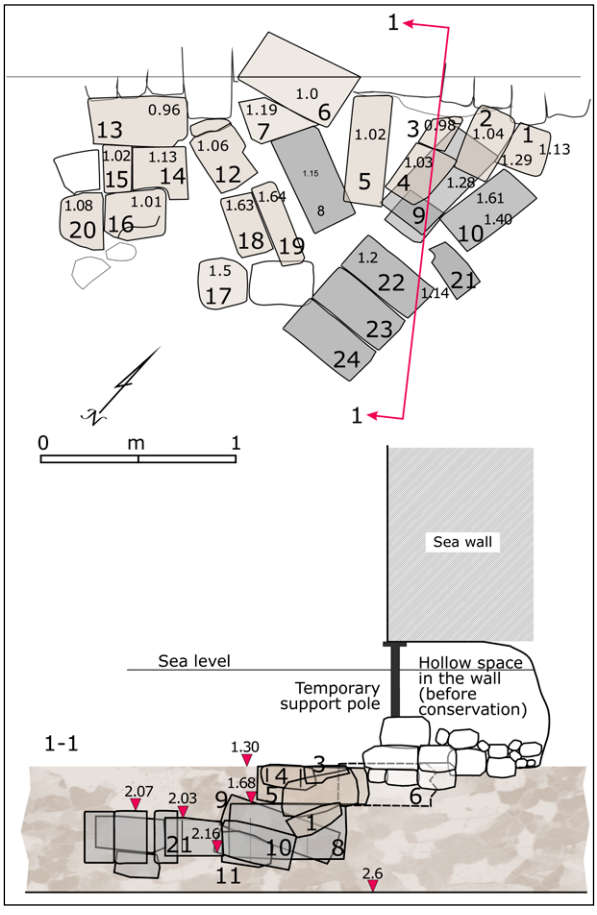


Figure 10. Plan and cross-section of the rockslide and the part of the foundation, stones 22-24 (Drawing: S. Ben-Yehuda).

Figure 11. The eastern face of the rectangular Hellenistic structure discovered in Area E. The structure is 8 m long and 1.6 m high and is built directly on the bedrock (Photo: J. Sharvit).

Figure 12. A row of wooden posts and beams that served as a foundation for the Ottoman seawall. The first row of stones was laid directly on top of the wooden beam. In some cases, the posts penetrate through all the layers into the bedrock (Photo: J. Sharvit).

were intended to prevent removal of the posts. A horizontal wooden frame, sawn from longer posts, was fixed with iron nails to the top sections of the upright posts. The first stone layer of the wall, consisting of large hewn stone blocks with chiselled edges, was placed over these timber frames. The posts were made of a species of tree, *Pinus brutia*, which grows in the northeastern part of the Mediterranean (Turkey, Cyprus). Samples of wood were dated by C14 to the years 1816-1846. This shows that the posts belong to the Ottoman wall foundation and that the wall was constructed after the city was conquered by the Egyptian Ibrahim Pasha.

In the centre of Area E (Fig. 3.4), another scatter of ashlars (0.6 x 0.6 x 1.2 m) belonging to a large building was uncovered, with some building blocks intact. This collapsed structure covered and sealed a layer of harbour sludge lying on the bedrock, which contained Hellenistic finds from the 3rd-2nd century BCE.

Figure 13. East-west view of the shipshed and slipway foundation. The size of the exposed structure is 5 m long and 8 m wide in total, the inner width is 6 m (see Fig. 14) (Photo: J. Sharvit).

At the foot of the military-style Ottoman building in Area F (a continuation of the fortification system), a section of a rectangular building was unearthed: it is 5 m long and 8 m wide with a general east-west orientation (Fig. 3.7). This structure continues underneath the Ottoman building, as well as extending seaward underneath the temporary battery (Fig. 13). The structure is built of two thick walls made of large cut *kurkar* slabs laid out in the Phoenician-style header technique (Arad and Artzy, 2007: 78, 82). Between the walls is a stone-paved floor some 6 m wide, which slopes down toward the sea.

In the centre of the floor, there is a groove 0.4 m wide and 0.2 m deep. There are perforations (*c.*100 mm diameter) in some of the nearby paving stones that may have held vertical timber props for supporting ships (Fig. 14). At the end of the floor close to the dam or rampart (facing the sea), there are many large, collapsed blocks that once belonged to the wall. In the adjacent excavation trench, several large, detached mooring stones were found. They may have originally been integrated into the dock and used for tying up ships (Fig. 15). Finds discovered in the foundations of the structure are dated to the Hellenistic period (3rd-2nd century BCE). The structure's location, size, and building technique all point to an installation intended for hauling ships (slipway) or for storing vessels for dry docking, probably a shipshed. It seems that the central groove was made to accommodate a ship's keel and protect it during hauling, while wooden props supported the vessel during maintenance. Similar installations have been studied in many ancient harbour sites around the Mediterranean: Piraeus, Bauindinai, Corfu, Sarkuzi, and others (Baika, 2003: 103-108; Blackman, 2003: 81-90; 2014: 531-536; Lovén, 2011: 15-30).

To determine whether the slipway continued into the sea to the east of the modern rampart, we excavated two underwater test pits inside 2 x 2 m metal caissons. We found a continuation of the structure 15 m from the wall in the first pit, and 17 m from the wall in the second pit, at 2.2 m depth below the modern sea-level. Beyond the easternmost pit, the seafloor had been disturbed by the construction of a modern fishing jetty, and by dredging and deepening of the harbour entrance channel to admit local boat traffic. The information from the pits nevertheless allowed us to calculate the slope of the slipway floor to *c.* 4-6 degrees.

From 2012-2014, the excavations were extended into the sea to locate the rest of the ancient quay, with a focus on finding the edges of the now-submerged structure and revealing its overall dimensions. During the excavation in 2012, we exposed the continuation of the quay floor at a distance of 24-25 m from the seawall.

In 2013 we opened a second underwater square 40 m from the seawall, at a depth of 1.3 m. This time, we did not find the quay floor, only layers of fill sediments mixed with articulated bivalve seashells at a depth of 1.8 m, and pottery dated to the Roman-Byzantine era (Fig. 16). At a depth of 2.5 m, the bedrock was exposed. Here, sections of a coral colony were found *in situ* and attached to some of the pottery sherds (Fig. 17). C14 tests of some of the coral samples dated them to the early 1st century BCE.

In the third year of excavation (2014) we opened a series of underwater test pits perpendicular to the wall and to the east of the platform that was exposed in Area C (Fig. 3; Squares III-VIII) in order to locate the edge of

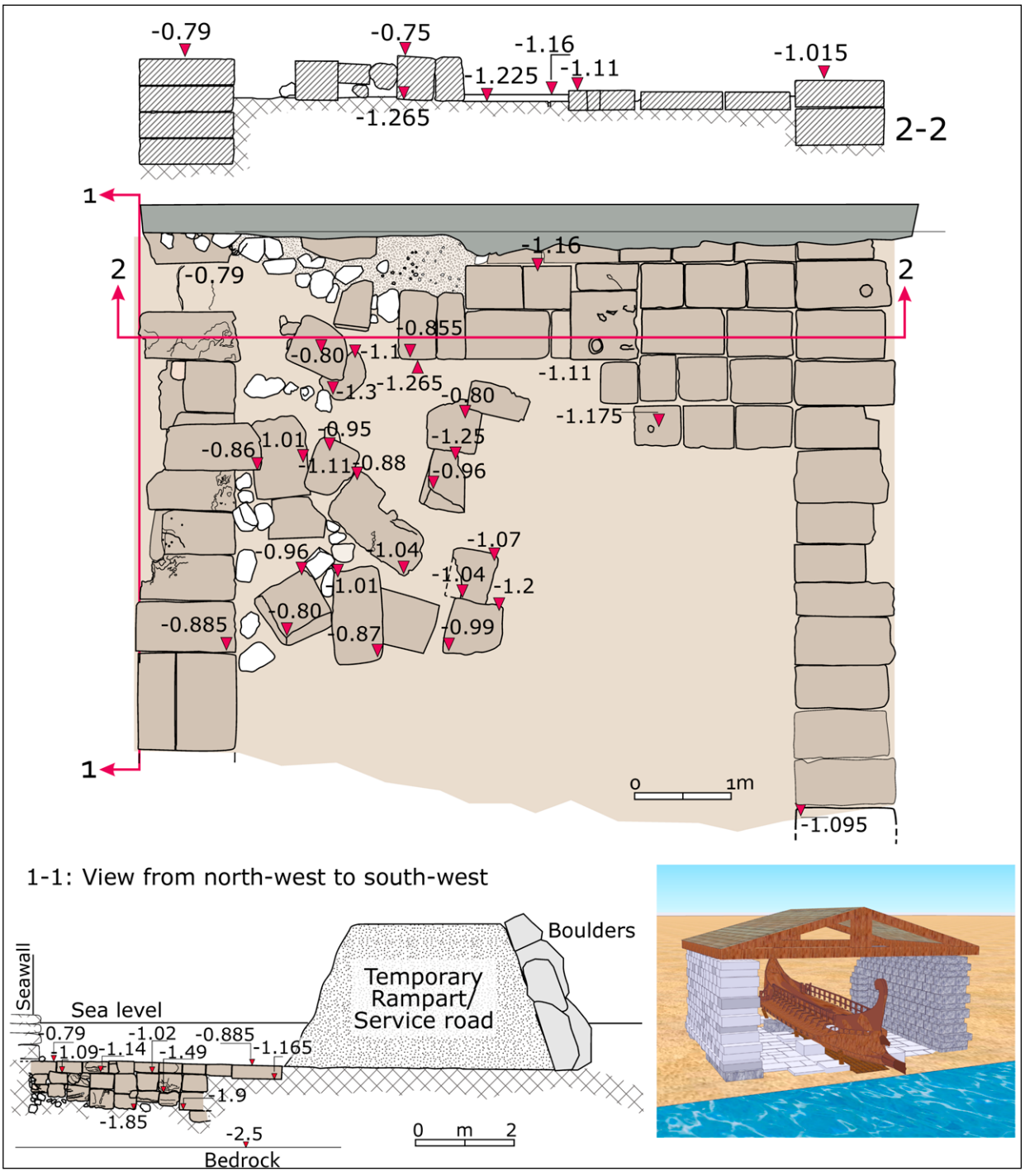


Figure 14. Plan and cross-section of the shipshed, on the lower right a possible reconstruction of the shipshed (Drawing: S. Ben-Yehuda).

the quay. Excavation in Square III continued down to the bedrock (-2.4 m depth) through fill layers of sediments and pottery, as in 2013 (Fig. 3). The excavation in the other squares (VI-VIII) exposed a new section of the quay floor and foundations built with massive *kurkar* blocks (1.5 x 0.6 x 0.3 m; Fig. 18). In Squares VII and VIII, the edge of the quay was exposed, comprising three levels of large *kurkar* blocks (1.5 x 0.6 x 0.5 m; Fig. 19) arranged in the header technique; these blocks rested directly on the bedrock (-2.6 m depth). The total height of the quay was 1.5 m.

Figure 15. Mooring stone excavated in Area F (Photo: J. Sharvit).

Figure 16. Underwater excavation in Square II (2013) revealed layers of fill sediments mixed with shells and Roman-Byzantine pottery continuing down to bedrock at a depth of 1.8-2.6 m (Photo: J. Sharvit).

Figure 17. Sample of a coral colony (Cladocora caespitosa) found on the bedrock and on some of the pottery sherds dated to the 1st century BCE; evidence for environment change (Photo: J. Sharvit).

Figure 18. Excavation in Square V (Area G) exposed a Hellenistic quay floor built from massive kurkar blocks (Photo: J. Sharvit).

Figure 19. Diver excavating along the quay edge built with massive blocks in the header technique (Square VII, Area G) (Photo: J. Sharvit).

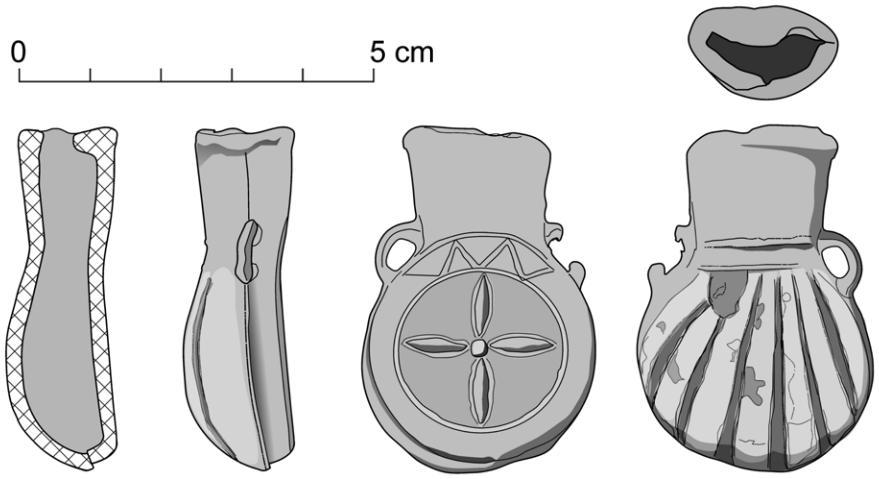


Figure 20. Pilgrim's lead ampulla dated to the 12th-13th century. The ampulla was found on the slipway/shipshed floor (Drawing S. Ben-Yehuda).

Pottery vessels

The archaeological excavation exposed six archaeological strata: I Modern (British Mandate); II Ottoman period (18-19th century CE); III Crusader period (12th-13th century CE) (Fig. 20); IV Byzantine (3rd-6th century CE); V Roman period (1st century BCE-1st century CE); and VI Hellenistic period (3rd century BCE-mid late 2nd century BCE) (Fig. 21).

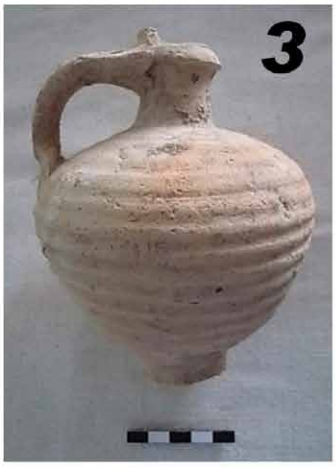
The Hellenistic material represents the largest ceramic corpus of this date yet published from underwater archaeological excavations at Akko harbour. The excavation provides an outline of the ceramics used by the city's residents, and of the culture and the economy of Akko between the 3rd century BCE and the early 1st century CE. The Hellenistic artefacts were recovered from the 0.6 m-thick layer above the bedrock and underneath the quay at Areas C-G. The assemblage includes a large number of amphorae and amphora handles with stamps, black-ware vessels, black and red 'Megarian' mould-made bowls (Fig. 21: 5-6), Eastern Sigillata ware types A-D, as well as Western Sigillata ware. The material represents both imported wares and common local wares (Fig. 21: 1-2; Ratzlaff *et al.*, 2018). Assessment of the volume of vessels by category verifies the diversity of pottery passing through the Hellenistic harbour: 41% tableware, 34% storage jars, 20% kitchen or utility vessels, 3% personal vessels, and 2% miscellaneous (Fig. 22). Depositional patterns during the height of the harbour activity show trade, or transfer, or storage of small groups of the small types of vessels (Ratzlaff *et al.*, 2018). The distribution of the vessels suggests a domestic environment within a predominantly Phoenician or Punic material culture, and with continuous commercial connections with mainland Greece, the Aegean islands, and Cyprus, as well as major centres on the coasts of Asia Minor.

Most of the Roman and Byzantine material was recovered near the surface at the topsoil of the quay floors from the 2013 and 2014 underwater seasons. In these two cases, the finds came from the harbour fill beyond the edge of the quay. The finds included a few coins, some metal objects, and numerous whole and broken ceramic vessels that belonged to imported and local amphorae, cooking pots, bowls, plates, and Eastern Sigillata ware. In the same layer of Roman-Byzantine Period material, coral fragments and colonies were found *in situ* on the seabed (2.3-2.6 m depth). Analysis of the well-preserved corals confirmed that they were buried alive and sealed with a protecting layer of sediment, possibly during a sudden and singular environment event. The presence of corals indicates that the area was originally clear of sediments because the corals cannot survive underneath sediment; the function of the 1.5 m-high quay only makes sense if it was constructed when the bedrock was exposed. From this information, we conclude that during the Hellenistic and Early Roman Periods there was much less sediment in the bay, which was likely more exposed. Pottery sherds from the Hellenistic and Roman Periods covered by marine organisms and corals show that the sherds lying on the seabed were not buried in sediment for many years after deposition (Giaime *et al.*, 2018: 1-20). Therefore, we conclude that the sedimentation of the site occurred during the Byzantine period and happened over a short period.

Figure 21 (opposite page). Finds from the sealed sludge layer: 1) bowl fragment bearing a relief in the shape of Hypnos, a winged child holding a baton in one hand and clutching a lion in the other: on the external side of the bowl is a white decoration of dolphins swimming among reeds (not shown); 2) jar; 3) jug; 4) lead slingshot bearing a relief of a scorpion; 5-6) mould-made pottery bowls; 7) marble figurine of a woman's head (Photo J. Sharvit).


1


2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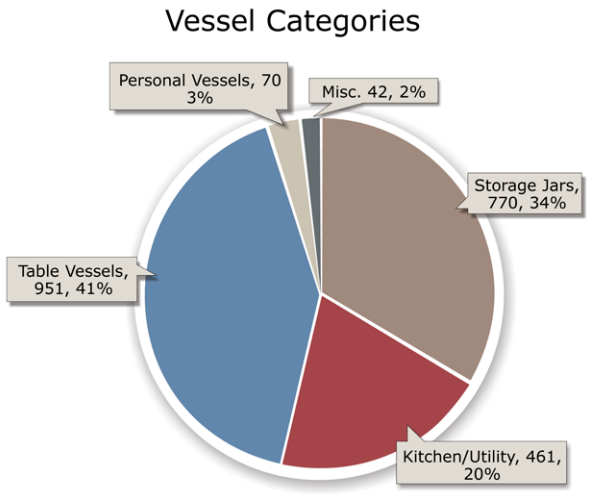

Figure 22. Chart showing the composition of the ceramic vessel assemblage.

Summary

Since the first research in Akko, efforts have been made to locate the harbour that was established as part of the military colony called Ptolemais in the year 261 BCE (the reign of Ptolemy II Philadephus). However, there was no evidence for the precise location of the military port before the excavations and discoveries of 2009-2013. During Ptolemy II's eventful reign, which saw the escalation of conflict between Egypt and the rival Seleucid Empire, Ptolemais and its port played a key part in Ptolemaic strategy (Tal, 2006: 6-7). The harbour facilities were an integral part of Egyptian defensive arrangements, a hub of administrative authority and a critical port for the Ptolemaic fleet. Ptolemais-Akko was therefore critical to Ptolemaic naval control of the Levantine coast, and a conduit for supplying the Egyptian terrestrial forces (Morrison, 1996; Finkleszjn, 2000: 207-220; 2013: 105-113). The fall of Ptolemais early in the Fifth Syrian War (201-198 BCE) was one of the critical factors that led to the collapse of Egyptian power in the region.

The Seleucid conquest of the former Ptolemaic possessions in the Levant, under Antiochus III Megas, brought about a boom of development in the city and port (Tal, 2006: 8). Akko benefited from increased Seleucid investment in naval power as Antiochus III and his successors sought to expand westward, and it maintained its status as the most important harbour of the southern Levant, and as a safe anchorage for the Seleucid fleet.

It appears that the port was built based on the Greek planning concept that divided the facilities into two separate spheres: the western part of the port was more commercial, and the eastern part was military. The southern breakwater, the Tower of Flies, and other port installations all conform to conventional Hellenistic harbour design. The findings of archaeological investigations in the modern port area (the fishing-boat port and marina) point to commercial maritime activities beginning in the 3rd century BCE and continuing until the present day (Galili *et al.*, 2010: 191-211). However, no clear evidence for the precise location of the military port has yet been identified.

The port installations discovered during the seawall excavations (monumental quay, mooring stones, large buildings, slipway and shipshed structures) all attest to the existence of a well-organized harbour built by a powerful and affluent central authority. Since these installations were built on the waterfront in the shallow water near the 1.5 m-high quay, it appears likely that they belonged to a naval facility established close to the city. Since all the floors were found 1-1.2 m below present-day sea-level, the ancient shoreline did not lie where it does today.

The distribution of the harbour installations reveals a large port sprawling over some 90 *dunams* (1 *dunam* = 1000 sqm), the outline of which extends from the shoreline in the north, the breakwater and western wall in the south (the modern port and marina), the island of the Tower of Flies and the submerged rampart in the east, and the port installations discovered along the foot of the seawall in the west. A port of this size could accommodate a large and varied number of vessels such as warships, commercial ships, and small fishing boats. Polybius (5.62.2-3) wrote about the presence of a military port in Akko, and the town's prominence as a highly contested strategic asset during the Syrian Wars confirms that the Ptolemies relied heavily on its facilities for their navy.

From archaeological as well as historical records we know that ancient warships were not left anchored in the open sea more than necessary, and were hauled onto land and housed in military shipsheds between campaigns. It is possible that the collapsed structures discovered along the foot of the seawall were components of a line of shipsheds, similar to the well-documented structures from other Hellenistic naval facilities, such as Zea harbour in Piraeus. Unfortunately, most of the Akko structures are now buried under the Ottoman seawall, and it is not possible to investigate the full extent of these Hellenistic installations.

To summarize, the builders of Akko's Hellenistic period port facilities almost certainly followed the Greek convention of constructing two or three separate harbours for commercial and military vessels. The commercial port was likely near the Tower of Flies, with the military port extending under the modern marina to the west. It was here, under the relatively shallow modern fishing-harbour, that recent drillings into the sediment have revealed the existence of a deep basin –

over 12 m deep – that could have accommodated even the largest ships of the Hellenistic world (Sharvit, 2013). A key question for future studies will be whether this basin once also supported colonies of coral, which would indicate that it filled with sediment over a short period, or perhaps even in a single catastrophic event such as an earthquake or tsunami.

The chronological groupings within the overall assemblage of the excavations reflect three phases in the development of material deposited in the harbour complex at Akko. The foundation of the Hellenistic harbour complex dates to the early 3rd century BCE, with occupation extending through the mid 1st century CE; there is no evidence of an earlier Classical or Iron Age phase of development, even though Akko was certainly already an important naval base before the Hellenistic period (Gambash, 2014).

The main period of activity in the port area is illustrated by the abundance of pottery dated from the mid 3rd century BCE through the early 1st century CE. Within this range, the sub-phases include: Strata IV Phase 1 (mid 3rd-mid 2nd century BCE), Strata IV Phase 2 (mid 2nd-mid 1st century BCE), and Strata V Phase 3 (mid 1st century BCE-mid 1st century CE). Phase 1 is characterized by a prominence of local and regionally produced vessels such as Central Coast fine ware, carinated cups, and incurve rim bowls, as well as neckless cooking pots from the area of Akko. At the same time, small quantities of vessels from the Aegean and Asia Minor were imported into Akko, particularly black-slipped bowls and 'fish plates'. Other regionally common vessels present in this initial phase of the harbour's operation include Phoenician bag-shaped jars in coastal fabrics; these are present throughout the first and second occupation phases of the harbour.

The first phase correlates to the founding and initial period of the harbour facilities as a base for the Ptolemaic fleet in the 1st century BCE. It should be noted that residual material from possible shipwrecks was deposited as fill during harbour use in the 4th-6th centuries BCE, but in such small amounts that the material makes up less than 0.025% of the total assemblage (the sample consists only of a few diagnostic sherds such as basket-handle jar-handles from Area E); these materials are not included in the general chronology. Similarly, Crusader period material from contexts mostly in Areas A, B, and C was not analysed as part of this assemblage.

The second phase (mid 2nd-mid 1st centuries BCE) represents the likely physical expansion of the harbour and increased commercial traffic, as indicated by the substantial increase in the volume of pottery present in Areas E and F in particular. This period also experiences an influx in new vessel types and wares entering the regional market, including BSP, Eastern Sigillata A (ESA), and Phoenician semi-fine tableware. While there are new forms of fine wares present throughout the harbour, the cooking vessels, in contrast, are locally produced. These vessels display variations their rim morphology, as exhibited by the addition of necked ledge-rim cooking pots and casseroles with bevelled and folded rims. During this phase, the Hellenistic harbour likely reached the height of its commercial importance in terms of volume of pottery passing through it, as well the physical expansion of the port, with vessel types from this phase distributed through each area.

The assemblage during phase three (mid 1st century BCE-mid 1st century CE) demonstrates some continuation of certain forms of ESA and semi-fine wares along with the addition of new vessel types both in fabric and shape, such as the ESA conical cup. New additions of imported fine wares include Cnidian grey ware carinated cups from Asia Minor, thin-walled beakers from Italy, and Western Sigillata plates, as well as a single example of an Italian baking pan (not uncommon in Palestine). There is also a significant decline in the appearance of Phoenician bag-shaped jars during this period. The final, third phase has material present in relatively small quantities throughout the harbour's excavated areas with a clear concentration in Area F.

The Ptolemaic foundation of Akko's Hellenistic harbour in the 3rd century BCE came at a turning point for the region. Ptolemy II Philadelphus rebuilt and rejuvenated the city, renaming it Ptolemais in 280 BCE (Diod. Sic. 19.93.7). The development of the harbour facilities fits well with the Ptolemaic interests in establishing an administrative and economic foothold controlling the central coast of the Levant. It was also at this time that the main area of habitation apparently shifted to the low-lying peninsula adjacent to the Hellenistic port, and away from the hill of Tell el-Fukhar, which had been the focus of Akko's occupation beginning in the Bronze Age (Berlin and Stone, 2016: 134; Dothan, 1976: 1-30). Over time, the harbour complex seems to have evolved beyond its primary military-administrative function into an important node in the regional trade network (Vitto, 2005: 153-179; Regev, 2009: 115-191), as well as the broader Mediterranean maritime economy. The architectural and ceramic finds from Akko reveal its importance as a centre of maritime trade, a place where goods brought in from production centres around the eastern Mediterranean could be bought and sold (Tatcher, 2000: 28-29). The ceramic remains exemplify the tendency towards mixed cargoes on smaller merchant vessels typical of the tramp trade that dominated the ancient Mediterranean maritime economy. Assessment of the volume of vessels by category reiterates the diversity of pottery passing through the Hellenistic harbour:

41% tableware, 34% storage jars, 20% kitchen or utility vessels, 3% personal vessels, and 2% miscellaneous.

By the end of the 2nd century BCE, territories in northern Palestine were only loosely controlled by the Seleucids, or else held by the Hasmoneans. Rather than suffering under the circumstances of instability, commercial activity in the Akko harbour prospered significantly, reaching the height of occupation sometime in the late 2nd century BCE. This correlates with other archaeological evidence for economic and settlement expansion during this period of weak administration in northern Palestine under the Seleucids in the late 2nd century BCE.

The ceramic assemblage from Akko shows a downturn in commercial activity by the end of the 1st century BCE and abandonment sometime in the 1st century CE (likely by mid century). Politically, the decline and eventual abandonment of the Hellenistic harbour coincides with the construction of Herod's harbour of Sebastos and the new city of Caesarea between 22 BCE and 10 or 9 BCE. With the construction of its new massive harbour, in 6 CE Caesarea became the provincial capital of the Roman province of Judaea. The economic and administrative focus of the region shifted to Caesarea, and maritime commerce followed; Akko did not recover its former status as the region's principal international port until the Crusader period. While some political reasons existed for Herod and his Roman patrons to have invested in Caesarea rather than Akko, the evidence of rapid sedimentation and collapsed port structures left *in situ* at Akko may indicate the city suffered from an earthquake or other catastrophe that rendered its harbour unusable, paving the way for the rise of Caesarea.

Nevertheless, Akko's strategic position continued to attract the attention of foreign invaders seeking a foothold on the long, exposed coast of the Levant. Burj el-Sultan was originally a Crusader tower built on the bedrock and may have guarded the opening to the 'internal port' in the Venetian quarter. This feature of medieval Akko could be identified with the harbour called La Busheri that was located between the arsenal and the city wall, from where Frederick the Second sailed back to his country in 1229. Based on the IAA's recent excavations in Akko, we suggest that during the Crusader period, building stone from the Hellenistic port was repurposed, creating a 20 m-wide gap between the Burj and the remaining quay, 2.5 m deep from modern sea-level to bedrock. During the Ottoman Period, probably while preparing the foundations for the wall, a massive rampart was constructed that re-sealed the opening between the Burj and the Hellenistic dock. This is the only place along the wall where a rampart was constructed, or where Ottoman foundations extended down to the harbour bedrock, revealing that in this section there was once a substantial opening. Clearly, the fortification planners deemed it crucial to close off the gap.

Around the area of the deeper inner harbour that filled up with sediment, the ancient structures and installations were probably demolished during the Mamluk period, and the Han el-Shawardeh was built over this area in the 18th century. The Ottoman seawall sustained heavy damage in the numerous battles fought over the city during the 18th and 19th centuries and was therefore in a perpetual process of repair and reconstruction. The excavation findings reveal that the wall's foundations were constructed and repaired using a variety of different techniques: a) layers of stone columns in secondary use (granite columns brought from Caesarea and *kurkar* columns from the rubble of Akko); b) a rampart; c) building over earlier construction remnants; and d) building on wooden frames supported by wooden posts. The use of wooden posts was not known in Akko before the IAA excavations along the foot of the seawall, and to date are unique in Israel. The date-range of these posts establishes parameters in which significant historical events took place, leading to restoration or rebuilding of the wall. The earlier date-range indicates construction during the reign of Abdullah Ibn Ali, who was appointed Pasha (governor) of Akko in 1819, and who built fortifications to resist a siege by land and sea, led by Suleiman, governor of Damascus, in 1821. The second possibility is the rehabilitation works carried out by Abdullah Pasha in 1831 as a pre-emptive move against the punitive siege of Akko launched by Ibrahim Pasha, the son of Muhamad Ali of Egypt. This siege ended after seven months with the occupation of the city by Ibrahim Pasha. The third alternative is the reconstruction of the city's fortifications by the Ottoman Turks after they renewed control of Akko in 1840. Our understanding of the extent of modern alterations to the ancient port facilities is still limited, but this will be an important focus of future research.

The underwater excavations at Akko over the seven years of restoration work along the Ottoman seawall have revealed the existence of ancient harbour structures built on an ambitious scale that befit Akko's status as one of the most important strategic hubs of the eastern Mediterranean during the Hellenistic period. Further investigations are needed to determine the exact dimensions of the ancient port and answer the intriguing question of how it became submerged and buried in sediment more than a metre beneath the modern sea-level. Future investigations will help solve these questions and contribute to our understanding of the Hellenistic Period in Akko.

Acknowledgements

The excavation and the research were possible with the financial support of Old Acre Development Company and an Honor Frost Foundation grant, as well as Oceangate foundation. Our thanks first to the underwater archaeol-

ogy team: Dror Planer underwater archaeology and team member Sharon Ben-Yehuda for the drawings, GIS and graphics; also, Steve Phelps, who started as a volunteer and become a team member; diving officer Eran Rozen; Dr Beverly Godman-Tchernov and her geoarchaeology research laboratory; Prof. Dan Tchernov, marine biologist at the Leon H. Charney School of Marine Sciences in the University of Haifa; Prof. Nili Lipschitz for dendroarchaeology and dendrochronology; the preservation engineer, Yaakov Schiffer, and dozens of students from the University of Rhode Island who spent the summer with us on excavations.

References

Arad, H., and Artzy, M., 2007, The Harbor of Atlit in Northern Canaanite Phoenician Context. *Near Eastern Archaeology* 70.2, 75-84.

Baika, K., 2003, Operating on Shipsheds and Slipways: Evidence of underwater configuration of slipways from the Neosoikos of 'Trypiti', in C. Beltrame (ed.*), Boats, Ships and Shipyards Proceedings of the Ninth International Symposium on Boat and Ship Archaeology Venice 2000,* 103-108. Oxford.

Ben-Yosef, D., 2008, Akko Bay: Hinterland of Phoenician Commercial City during the Persian Period, in S. Bar (ed.), *In the Hill-Country, and in the Shephelah, and in the Arabah, Studies and Researches Presented to Adam Zertal in the Thirtieth Anniversary of the Manasseh Hill-Country Survey*, 271-290. Jerusalem.

Berlin, A.M. and Stone, P.J., 2016, The Hellenistic and Early Roman Pottery, in M. Hartal, D. Syon, E. Stern and A. Tatcher (eds), *Akko II, The Early Periods*, 133-202. Jerusalem: Israel Antiquities Authority Reports 60.

Beeri, R., 2008, Hellenistic Akko, in S. Bar (ed.), *In the Hill-Country, and in the Shephelah, and in the Arabah, Studies and Researches Presented to Adam Zertal in the Thirtieth Anniversary of the Manasseh Hill-Country Survey*, 195-210. Jerusalem.

Blackman, D., 2003, Progress in the Study of Ancient Shipsheds: A review, in C. Beltrame (ed.), *Boats, Ships and Shipyards: Proceedings of the Ninth International Symposium on Boat and Ship Archaeology Venice 2000,* 81-90. Oxford.

Blackman, D., 2014, Ancient Shipsheds, in S. Ladstätter, F. Pirson, and T. Schmidts (eds), *Harbors and Harbor Cities in the Eastern Mediterranean from Antiquity to the Byzantine Period: Recent Discoveries and Current Approaches*. BYZAS 19, 523-541.

Dichter, B., 1973, *The Maps of Acre, An Historical Cartography*. Acre.

Diodorus of Sicily, English trans. C.H. Oldfather, 1960-1963, London.

Dothan, M., 1976, Akko: Excavation Report, First Season, 1973-4. *BASOR* 224, 1-48.

Finkielsztejn, G., 2000, Ampores importées au Levant Sud à l'epoque hellénistique, in M. Kazakou, G. Nestroridou (eds), *Fifth Scientific Meeting on Hellenistic Pottery: Problems of Chronology, Closed Contexts, Workshops, Chania 1997*, 207-220. Athens.

Finkielsztejn, G.,2013, Stamped Amphorae Handles from 'Akko'. *Atiquot* 76, 105-113. Jerusalem.

Flinder, A., Linder, E. and Hall, E.T., 1993, Survey of the Ancient Harbour of Akko, 1964-1966, in M. Heltzer, A. Segal, and D. Kaufman (eds), *Studies in The Archaeology and History of Ancient Israel*, 199-226. Haifa.

Galili, E., Rosen, B., Zviely, D., Siberstein, N., and Finkielsztejn, G., 2010, The evolution of Akko Harbor and its Mediterranean maritime trade links. *Journal of Island and Coastal Archaeology* 5, 191-211.

Gambash, G., 2014, En route to Egypt: Akko in the Persian period. *Journal of Near Eastern Studies* 73 No. 2, 273-282.

Grainger, J.D., 2010, *The Syrian Wars*. Mnemosyne Supplements, History and Archaeology of Classical Antiquity, vol. 320.

Giaime, M., Morhange, C., Marriner, N., López Cadavid, G. and Artzy, M., 2018, Geoarchaeological investigations at Akko, Israel: New insights into landscape changes and related anchorage locations since the Bronze Age. *Geoarchaeology* 33, 641-660. *https://doi.org/10.1002/gea.21683*

Kahanov, Y., Cvikel, D., Pashut, D. and Yurman, A., 2007, Akko Underwater Excavation 2007. *Recanati Institute for Maritime Studies News* 33, 16-18.

Kahanov, Y., Cvikel, D., Pashut, D. and Yurman, A., 2008, Akko Underwater Excavation 2008. *Recanati Institute for Maritime Studies, News* 34, 19-22.

Kasher, A., 1988, *Canaan, Philistine, Greece, and Israel: Hellenistic Jews and the Second Temple Period: (332 BCE-70 CE)*. Yad Yitzhak Ben-Zvi, Jerusalem.

Kedar, B.Z., 1997, The Outer Walls of Frankish Acre. *Atiquot* 31, 157-180.

Linder, E. and Raban, A., 1966, From the Diary of the Acre Expedition 1965. *Bimtzuloth-Yam* No. 7, 23-27. Tel Aviv.

Lovén, B., 2011, *The Ancient Harbours of the Piraeus – Volume I, The Zea Shipsheds and Slipways: Architecture and Topography*. Monographs of the Danish Institute at Athens vol. 15, 1.

Makhouly, N. and Johns, C.N., 1946, *Guide to Acre*. Government of Palestine Department of Antiquities. Jerusalem.

Morrison, J. S., 1996, *Greek and Roman Oared Warships 339-30 BC*. Contributions by J.F. Coates Oxbow monograph 62.

Polybius, Vols I-IV, *The Histories of Polybius*, in W.R. Paton, 1922-1927 (ed. and trans.) Loeb Classical Library, Cambridge, Ma.

Raban, A., 1978, Notes and News, Israel: Akko Harbor and Bay. *The International Journal of Nautical Archaeology* 7.3, 238-240.

Rappaport, U., 1970, When was the Letter of Aristeas written? in E. Gilboa, B. Mevurach, U. Rappaport and A. Schochat (eds), *Studies in the History of the Jewish People and Land of Israel* vol. 1.

Ratzlaff, A., Constantine, N. and Buch, P., 2018, *Excavation at the Hellenistic Harbour of Akko, Preliminary Report 1*. Israel Antiquities Authority, Jerusalem.

Regev, D., 2009, Akko-Ptolemais, a Phoenician city: The Hellenistic pottery. *Mediterranean Archaeology* 22-23, 115-191.

Schaffer, Y., Sharvit, J. and Planer, D., 2014, Structural and conservation solutions for the treatment of the sea front walls of old Akko (Acre), Israel, in F. Peña and M. Chávez (eds) *SAHC2014-9, International Conference on Structural Analysis of Historical Constructions*, 1-12. Mexico City.

Schiler, E., 1983, Han el-Shawarde, *Akko Sites,* KARDOM 24-25, Jerusalem.

Sharvit, J., 2013, *Test underwater excavation prior to the construction of the new passenger jetty, Akko S-416/2013, Preliminary Excavation Report.* Israel Antiquities Authority, Jerusalem.

Sharvit, J. and Planer, D., 2008, *Archaeological testing trenches between the 'Susim beach' and Khan Esh-Shawarda*. Report to Old Acre Development Company, Akko.

Sharvit, J., Planner, D. and Buxton, B., 2013, Preliminary Findings from Archaeological Excavation Along the Foot of the Southern Seawall of Akko, 2008-2012. *Michmanim* 24, 39-52. Hecht Museum, University of Haifa.

Stern, E., 1992, *Dor – The Rulers of the seas, Ten years of excavations in the Israeli-Phoenician harbor town on the Carmel Coast*. The Bialik Institute, Jerusalem.

Strabo, *The Geography*, H.L. Jones, 1917, (trans.). Cambridge, Ma.

Tal, O., 2006, *The Archaeology of Hellenistic Palestine Between Tradition and Renewal*. The Bialik Institute, Jerusalem.

Tatcher, A., 2000, Two Trial Excavations at Akko. *Atiquot* 34, 27-41.

Vitto, F., 2005, Hellenistic and Crusader Remains at Montmusard, Acre (Akko). *Atiquot* 50, 153-179.

Winter, P.H., 1944, *Preservation and Reconstruction of Acre, Survey and Report*, Public Works Department, Government of Palestine, Appendix V, 9-10.